

Claims:

1. An ANFO explosive composition comprising a mixture of ammonium nitrate particles, an organic combustible fuel, and a chemical coupling agent having an aliphatic portion and an epoxy group.
- 5 2. The explosive composition as claimed in claim 1 wherein the chemical coupling agent is selected from the group consisting of an epoxidized oil, an ester derivative of epoxidized oil, and mixtures thereof.
3. The explosive composition as claimed in claim 1 wherein the chemical coupling agent is an epoxidized vegetable oil.
- 10 4. The explosive composition as claimed in claim 1 wherein the chemical coupling agent is an epoxidized fish oil.
5. The explosive composition as claimed in claim 1 wherein the chemical coupling agent is selected from the group consisting of epoxidized soybean oil, epoxidized linseed oil and mixtures thereof.
- 15 6. The explosive composition as claimed in claim 2 wherein the chemical coupling agent contains a plurality of epoxy groups per molecule of chemical coupling agent.
7. The explosive composition as claimed in claim 1 wherein the chemical coupling agent is present in an amount from about 0.1 to about 10
- 20 wt % based on the weight of the organic combustible fuel.
8. The explosive composition as claimed in claim 3 wherein the chemical coupling agent is present in an amount from about 1 to about 4 wt % based on the weight of the organic combustible fuel.
9. The explosive composition as claimed in claim 8 wherein the
- 25 organic combustible fuel is present in an amount from about 5 to about 6 wt % based on the weight of the explosive composition.

10. The explosive composition as claimed in claim 9 wherein the organic combustible fuel comprises diesel oil.
11. The explosive composition as claimed in claim 1 wherein the ammonium nitrate particles have a density above about 0.86 g/cc.
- 5 12. The explosive composition as claimed in claim 11 wherein the ammonium nitrate particles substantially comprise mini-prills.
13. The explosive composition as claimed in claims 11 wherein the density of the ammonium nitrate particles is above about 1.00 g/cc.
- 10 14. The explosive composition as claimed in claim 1 wherein the aliphatic portion has from about 14 to about 18 carbon atoms.
15. The explosive composition as claimed in claim 1 wherein the chemical coupling agent is selected so as to produce an explosive composition that has an oil separation less than about 1 %.
16. The explosive composition as claimed in claim 1 wherein the explosive composition comprises less than about 3 wt % water.
17. The use of a chemical coupling agent in an ANFO explosive composition wherein the chemical coupling agent has a long chain carbon portion having from about 3 to about 24 carbon atoms and an epoxy group.
18. The explosive composition as claimed in claim 17 wherein the chemical coupling agent is selected from the group consisting of an epoxidized oil, an ester derivative of epoxidized oil, and mixtures thereof.
- 20 19. The use as claimed in claim 17 wherein the chemical coupling agent is an epoxidized vegetable oil.
- 20 25 20. The use as claimed in claim 17 wherein the chemical coupling agent is an epoxidized fish oil.

21. The use as claimed in claim 17 wherein the chemical coupling agent is selected from the group consisting of epoxidized soybean oil, epoxidized linseed oil and mixtures thereof.
22. The use as claimed in claim 17 wherein the chemical coupling agent contains from 3 to 6 epoxy groups per molecule of chemical coupling agent.
23. The use as claimed in claim 17 wherein the chemical coupling agent contains from 4 to 5 epoxy groups per molecule of chemical coupling agent.
- 10 24. The use as claimed in claim 17 wherein the chemical coupling agent is present in an amount from about 0.1 to about 10 wt % based on the weight of fuel oil in the ANFO explosive composition.
25. The use as claimed in claim 23 wherein the chemical coupling agent is present in an amount from about 1 to about 4 wt % based on the weight of fuel oil in the ANFO explosive composition.
26. The use as claimed in claim 17 wherein the ANFO explosive composition comprises ammonium nitrate particles having a density above about 0.86 g/cc.
27. The use as claimed in claim 24 wherein the ammonium nitrate particles substantially comprises particles having diameters in a range of between about 0.5 to about 4 mm.
28. The use as claimed in claim 24 wherein the ammonium nitrate particles substantially comprise particles having diameters in a range of between about 0.5 to about 1.5 mm.
- 25 29. The use as claimed in claims 24 wherein the density of the ammonium nitrate particles is above about 0.86 g/cc.

30. The use as claimed in claim 22 wherein the long chain carbon portion has from about 3 to about 24 carbon atoms.

31. A method for producing an ANFO explosive composition, comprising:

- 5 a) providing an organic combustible fuel, ammonium nitrate particles and a chemical coupling agent having a long chain aliphatic portion and an epoxy group;
- 10 b) combining the organic combustible fuel, ammonium nitrate particles and a chemical coupling agent to produce the ANFO explosive composition.

32. The method as claimed in claim 31 further comprising selecting the chemical coupling agent from the group consisting of an epoxidized oil, an ester derivative of epoxidized oil, and mixtures thereof.

33. The method as claimed in claim 32 further comprising selecting 15 epoxidized vegetable oil as the chemical coupling agent.

34. The method as claimed in claim 32 further comprising selecting epoxidized fish oil as the chemical coupling agent.

35. The method as claimed in claim 31 further comprising selecting 20 a chemical coupling agent containing a plurality of epoxy groups per molecule of chemical coupling agent.

36. The method as claimed in claim 31 further comprising selecting a chemical coupling agent having from 4 to 6 epoxy groups per molecule of chemical coupling agent.

37. The method as claimed in claim 31 further comprising 25

- a) combining the organic combustible fuel and the chemical coupling agent to form a liquid mixture; and,
- b) combining the liquid mixture with the ammonium nitrate particles to produce the ANFO explosive composition.

38. The method as claimed in claim 31 further comprising selecting diesel oil as the organic combustible fuel.
39. The method as claimed in claim 31 further comprising selecting ammonium nitrate particles having a density above about 0.86 g/cc as the 5 ammonium nitrate particles.
40. The method as claimed in claim 31 wherein the ammonium nitrate particles substantially comprise particles having diameters in a range of between about 0.5 to about 4 mm.
41. The use as claimed in claim 31 wherein the ammonium nitrate 10 particles substantially comprise particles having diameters in a range of between about 0.5 to about 1.5 mm.
42. The method as claimed in claim 31 further comprising selecting ammonium nitrate particles having a density above about 1.00 g/cc as the ammonium nitrate particles.
- 15 43. The method as claimed in claim 31 further comprising selecting a compound having an aliphatic potion with from about 14 to about 18 carbon atoms as the chemical coupling agent.
44. The method as claimed in claim 31 further comprising combining a sufficient amount of chemical coupling agent in the ANFO explosive 20 composition such that the ANFO explosive composition has an oil separation less than about 1 %.